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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR		ATTORNEY DOCKET NO.
09/372,636	08/11/99	HORNSCHEMEYER	W	364/56

026646
KENYON & KENYON
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IM52/0606

EXAMINER
KERNS,K

ART UNIT	PAPER NUMBER
1725	12

DATE MAILED: 06/06/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No.	Applicant(s)	
	09/372,636	HORNSCHEMEYER ET AL.	
	Examiner	Art Unit	
	Kevin P. Kerns	1725	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 March 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☒ Claim(s) *1, 3, 5, and 12* is/are objected to.

8)☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15) ☒ Notice of References Cited (PTO-892)
16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
18) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
19) ☐ Notice of Informal Patent Application (PTO-152)
20) ☐ Other:

DETAILED ACTION

Drawings

1. The corrected or substitute drawings were received on March 21, 2001. These drawings are approved by the examiner.

2. New formal drawings are required in this application because the substitute drawings are marked up (informal). Applicant is advised to employ the services of a competent patent draftsperson outside the Office, as the Patent and Trademark Office no longer prepares new drawings.

Specification

3. The disclosure is objected to because of the following informalities: on page 15, line 7 of the paragraph starting with "It is...", "thattargeted" should be changed to "that are targeted". On page 17, line 1 of the paragraph starting with "Thus a...", the square box after "28" should be replaced by a degree symbol. Corrections and/or clarifications are required for these and other errors that occur throughout the specification.

Claim Objections

4. Claims 1, 3, 5, and 12 are objected to because of the following informalities: in claim 1, last 2 lines, the word "an" should be added before "increased", and "stresses areas" should be changed to "stressed areas of". In claim 3, line 2, the word "of" after "having" should be deleted. In claim 5, line 3, "can becomes" should be changed to either "can become" or "becomes", and "in the" should be deleted after "smaller". In claim 12, line 3, "form" should be changed to "from". Appropriate correction is required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1-15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the limitation "the critically stresses (stressed) areas" in the last 2 lines of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claims 6 and 7 recite the limitations "the meniscus" and "the broad-side wall". There is insufficient antecedent basis for these limitations in the claims.

Claims 8 and 9 recite the limitations "the surface-related heat flow", "the more stressed area", and "the bath surface". There is insufficient antecedent basis for these limitations in the claims.

Claim 10 recites the limitations "the bath" and "the broad-side walls". There is insufficient antecedent basis for these limitations in the claim.

Claim 11 recites the limitations "the wall" and "the bath surface area". There is insufficient antecedent basis for these limitations in the claim.

Claim 13 recites the limitations "the spacing" and "the bath surface". There is insufficient antecedent basis for these limitations in the claim.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

8. Claims 1, 6, 7, and 10-13 are rejected under 35 U.S.C. 102(e) as being anticipated by Grove et al. (US 5,927,378).

Grove et al. disclose a continuous casting mold assembly (funnel-shaped with billet-entrance side wider than billet-exit side) in which molten metal is shaped (formed) and cooled within the casting space, further containing a selective cooling structure to accommodate heat transfer inequality due to circulation patterns, which lead to mold deterioration, particularly in the meniscus region of the mold assembly (abstract; column 1, lines 60-63; column 2, lines 4-30; column 3, lines 12-27; and Figures 2 and 3). The mold assembly has a plurality of cooling slots (grooves), in which the area around the meniscus (thermally stressed area) contain slots machined to be deeper to produce an enhanced cooling effect at the area proximate to the meniscus, while producing a diminished cooling effect to other portions of the assembly (column 3, lines 28-67; column 4, lines 1-19; and Figures 2 and 3). The width, length, spacings relative to transition region III (stressed area), and/or depths of the slots (see slots 1-19 in Figure 2), as well as the residual thickness parameters would be varied (column 4, lines 20-53; and Figures 2 and 3). The variable wall thickness in the meniscus region (thermally stressed area of the broad-side wall) is reduced on the order of a few millimeters (column 4, lines 20-53; and Figures 2 and 3).

9. Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by Villanueva et al. (US 5,797,444).

Villanueva et al. disclose an ingot mold (form-giving die of high heat conductivity) for continuous casting of metals in which its cooling-side surface has depressions, or cooling-optimized areas to constitute a region having elevated heat transfer coefficients (abstract; column 2, lines 3-8 and 20-28; and Figures 1 and 2). These regions of enhanced heat transfer, i.e. rate of heat flow, are generally located over the area of the mold where optimized heat dissipation is desired, or relative to the other areas of the mold (column 1, lines 14-16 and 24-26; and column 2, lines 3-5, 20-24, 35-37, and 44-46). The cross-sectional area at the casting pour-in side is larger than that of the billet exit side (abstract; column 1, lines 5-10; and Figures 3, 4, and 8).

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

11. Claims 1-5 are rejected under 35 U.S.C. 102(a) as being anticipated by Stagge et al. (WO97/43063). Note: page numbers and lines herein refer to the English translation (copy provided) of this German patent. See the prior office action for the corresponding German pages/lines, if necessary.

Stagge et al. teach a liquid-cooled chill mold (casting die) with a form-giving casting die body (page 6, lines 2-8; and Figure 1), which is made of a material of high-heat conductivity, namely copper (page 3, lines 3-12; page 6, lines 17-19; and Figure 3).

The cooling-surface side of the chill mold, comprised of a cooling zone with multiple cooling channels for greater heat flow dissipation, is oriented on the sides of the mold with the thermally and mechanically stressed areas of the mold (page 4, lines 2-26; page 5, lines 1-5; page 6, lines 24-26; and Figures 2-4). The liquid-cooled chill mold (casting die) includes a cavity that is composed of two broad-side walls and narrow-side walls delimiting the width of the slab, or billet (page 6, lines 2-16). The cross-section of the mold at the pouring-in-side end is greater than at the billet-exit-side end, or of a descending funnel shape with a hollow cavity becoming smaller in the pouring direction (page 4, lines 6-8; and Figure 1).

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

13. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

14. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over either Villanueva et al. (US 5,797,444) or Stagge et al. (WO97/43063) in view of Klein et al. (US 5,095,970).

Villanueva et al. and Stagge et al. each disclose all the elements of claim 1 above. Neither Villanueva et al. nor Stagge et al. teaches the cooling zone extending at least 20% (or 30-60%) of the length of the meniscus of the broad-side wall.

However, Klein et al. teach a cooling device along the height of the wide side of the mold cavity that extends approximately 55-75% of the height of the wide sides of the walls (column 1, lines 29-34; column 2, lines 67-68; column 3, lines 1-4; and Figures 1-4) for the purpose of uniform cooling of the metal strand product (column 1, lines 24-26).

It would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to combine the liquid-cooled chill mold (casting die) of Stagge et al. with the cooling device of Klein et al. in order to obtain uniform cooling of the product (column 1, lines 24-26).

15. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over any one of Grove et al. (US 5,927,378), Villanueva et al. (US 5,797,444), or Stagge et al. (WO97/43063) in view of Hargassner et al. (US 5,117,895).

Grove et al., Villanueva et al., and Stagge et al. each disclose all the elements of claim 1 above. Neither Grove et al., Villanueva et al., nor Stagge et al. teaches a surface-related heat flow in the more stressed area of the bath surface that is 5-40% (or 10-20%) greater than in the other areas of the bath surface.

However, Hargassner et al. teach a variable heat transmission coefficient (alpha) between the internal plate and the coolant with values ranging between 20 and 70 kW/m^2K, preferably between 25 and 50 kW/m^2K (column 1, lines 51-59). The heat transmission coefficient is dependent on the coolant flow velocity and the width of the coolant ribs (column 3, lines 36-45 and 66-68; column 4, lines 1-17 and 55-61; the table in column 4; and Figures 5-8). These variables are optimized for the purpose of producing effective cooling of the internal casting mold plates (column 1, lines 37-50).

One of ordinary skill in the art would have recognized the optimum values of coolant flow velocity would directly related to controlling the heat transmission coefficient ranging between 20 and 70 kW/m^2K (ranging up to a factor of 3.5), which would entirely include the variations of 5-40% disclosed herein. Discovery of optimum values of resulting effective variables in a known process is within the level of ordinary skill in the art. In re Boesch and Slaney, 205 USPQ 215 (1980).

It would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to combine the liquid-cooled chill mold (casting die) of Stagge et al. with the range of values of heat transmission coefficients, channel widths, and flow velocities (Figures 5 and 8) of Hargassner et al. to calculate the surface-related heat flow for improving cooling efficiency of the mold plates (column 1, lines 37-50).

16. Claims 12-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over either Villanueva et al. (US 5,797,444) or Stagge et al. (WO97/43063) in view of Nakashima et al. (US 5,207,266).

Villanueva et al. and Stagge et al. teach all the elements of claim 1 above. Neither Villanueva et al. nor Stagge et al. teaches narrower configured coolant channels or cooling bore holes running parallel to the pouring direction with spacings of at least 20% less than in the horizontal adjoining areas of the bath surface in the transition area.

However, Nakashima et al. teach narrower configured coolant channels with regard to their spacings and widths (column 1, lines 47-61; column 4, lines 33-63; and Figures 2, 9, 11-13, and 16). These coolant channels are arranged in a parallel fashion in the thermally stressed area of the mold wall, as shown by the temperature gradients

(Figures 11-13 and 16). The spacing of the coolant channels (as defined by the widths w, 1.5w, and W) are at least 20% less than the horizontal adjoining area(s) of the surface in the transition (cooling) area(s) (Figures 2, 13 and 16). Additional coolant channels (bore holes) of varying widths and angles are situated between the surface coolant channels (Figure 9). The increased number of coolant channels are desired for the purpose of obtaining a more uniform cooling effect (column 1, lines 39-46).

It would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to combine the liquid-cooled chill mold (casting die) of Stagge et al. with cooling channels of various spacings and widths taught by Nakashima et al. in order to achieve a more uniform cooling effect (column 1, lines 39-46).

Response to Arguments

17. Applicant will note the above approval of the corrections to the drawings (although new formal drawings are still required), in addition to objections to the specification.

Although some of the rejections under 35 USC 112, 2nd paragraph have been withdrawn by the examiner, it is noted that several rejections under 35 USC 112, 2nd paragraph remain, and were in fact not even addressed directly by the applicant in the amendment of March 21, 2001. Corrections to these rejections are required, and are described in detail above.

The applicant's attention is also drawn to the two new rejections under 35 USC 102, as well as the withdrawal of the 35 USC 103 rejections based on the Rode et al. reference, which had a filing date after the priority date of this application. However,

claims 1-15 remain rejected based on the both the remaining and new grounds of rejection.

Applicant's arguments filed March 21, 2001, have been fully considered but they are not persuasive.

With regard to the Stagge et al. reference (claims 1-5 rejected under 35 USC 102), it is noted that the liquid-cooled (copper) mold of Stagge et al. is funnel-shaped and contains areas that are more susceptible to heat and mechanical stresses than in other areas of the mold. This is in contrast to the applicant's argument that there exist no such stressed areas for which enhanced cooling is provided in the liquid-cooled mold of Stagge et al. Critically high thermal and mechanical stresses also exist at the bath level (meniscus region), for which Stagge et al. preferentially arranges a multiplicity of cooling bores. As a result, an increased cooling rate exists at and near the bath level with respect to other areas of the mold.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., cooling zones surrounding all sides of the mold per the arguments against the rejections of claims 6 and 7) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

With regard to claims 6 and 7, the applicant has asserted that the teachings of Stagge et al. in combination with Klein et al. contradict each other. However, as mentioned in the above paragraph, the limitations of these claims do not suggest that all mold walls have to be cooled, only that a differential cooling zone be present. Although it is asserted by the applicant that the Klein et al. mold has uncooled narrow sides, there is a cooling differential in both the Stagge et al. and Klein et al. teachings. Therefore, it would have been obvious to one of ordinary skill in the art to have combined the Stagge et al. cooling zone and the Klein et al. cooling device along the height of the wide side of the mold cavity that extends approximately 55-75% of the height of the wide sides of the walls in order to obtain uniform cooling of the product.

With regard to claims 8 and 9, the applicant argues that the coolant speed maintains the heat transmission coefficient between a range of 20 and 70 kW/m^2K. The examiner respectfully asserts that these variables would be optimized for the purpose of producing effective cooling of the internal casting mold plates. One of ordinary skill in the art would have recognized the optimum values of coolant flow velocity would directly related to controlling the heat transmission coefficient ranging between 20 and 70 kW/m^2K (ranging up to a factor of 3.5), which would entirely include the variations of 5-40% disclosed in claims 8 and 9.

Claims 12-15 are now rejected under either Villanueva et al. or Stagge et al. in view of Nakashima et al. No arguments were directly presented against the content of the Nakashima et al. reference in the applicant's amendment.

Claims 1-15 remain rejected for both new and prior reasons presented above.

Conclusion

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin P. Kerns whose telephone number is (703) 305-3472. The examiner can normally be reached on Monday-Friday from 8:00am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Dunn can be reached on (703) 308-3318. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-7718 for regular communications and (703) 305-6078 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

KPK
kpk
June 1, 2001

Tom Dunn
TOM DUNN
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